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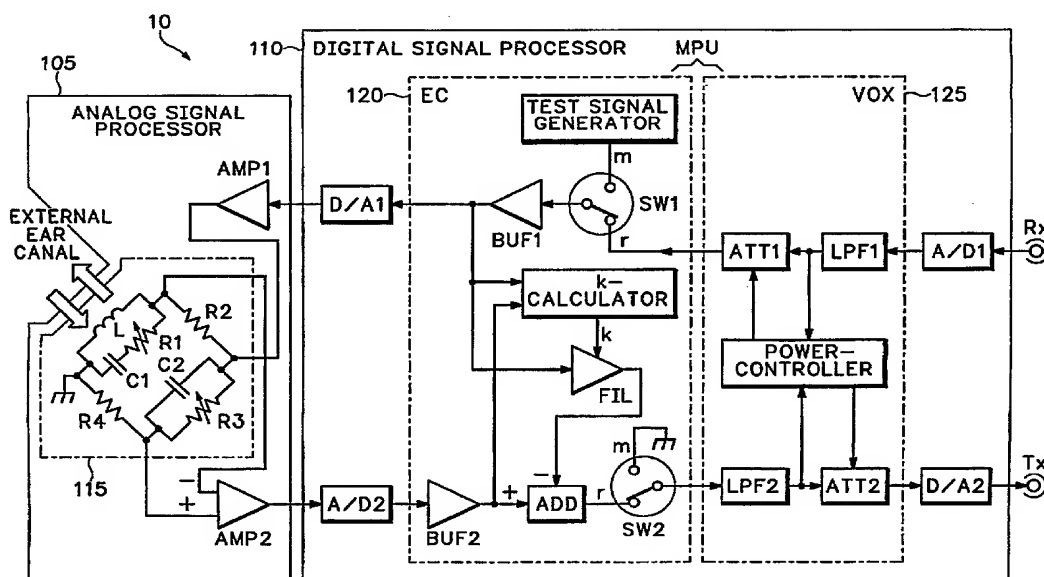
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[Continued on next page]

(54) Title: TWO-WAY COMMUNICATIONS DEVICE HAVING A SINGLE TRANSDUCER



(57) Abstract: Embodiments of the invention provide a small and economical two-way communications device that has both an excellent echo-cancellation function that substantially suppresses echoes over the entire frequency range and an excellent voice-operated exchange function that provides natural switching of conversation sounds while protecting against unnatural disconnection or echoes during conversation, even when a reception signal and a transmission signal are superimposed in a single transducer.



**Published:**

- with international search report
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

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# INTERNATIONAL SEARCH REPORT

International application No.

PCT/US04/37409

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : H04M 1/00,9/00,9/08

US CL : 379/406.01

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 379/406.01-406.16,433,420.01-420.04; 381/317,318,71.1-71.4,150,151,190,380,163

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6,415,034 B1 (HEITANEN) 02 July 2002 (2.07.2002), Col 5 line 25-Col 7 line 23	1-3,5-7,11-13,19,22
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Y		4,8-10,14-18,20-21,23-27
Y	US 6,480,610 B1 (FANG et al.) 12 November 2002 (12.11.2002), Col 4 line 14 to Col 5 line 30	4,8-10,14,20,21,23-27
Y	US 6,357,292 B1 (SCHULTZ et al) 19 March 2002 (19.3.2002), Col 27 line 55 to Col 28 line 30	15-18



Further documents are listed in the continuation of Box C.



See patent family annex.

\* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"B" earlier application or patent published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T"

later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X"

document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y"

document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&"

document member of the same patent family

Date of the actual completion of the international search

13 June 2005 (13.06.2005)

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## INTERNATIONAL SEARCH REPORT

International application No.

PCT/US04/37409

### Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:  
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

### Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:  
Please See Continuation Sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.: 1-27

Remark on Protest

☐  
☐

The additional search fees were accompanied by the applicant's protest.

No protest accompanied the payment of additional search fees.

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US04/37409

### BOX III. OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

This application contains claims directed to more than one species of the generic invention. These species are deemed to lack unity of invention because they are not so linked as to form a single general inventive concept under PCT Rule 13.1.

In order for more than one species to be examined, the appropriate additional examination fees must be paid. The species are as follows:

GROUP I: Claims 1-27 are drawn to a two-way communications device with a digital processing section implemented to remove echo from the transmitted signal.

GROUP II: Claims 28-43 are drawn to a two-way communications device with a digital processing section that selectively switches between transmission and reception modes

GROUP III: Claims 44 and 45 are drawn to a two-way communications device with a piezoelectric device supported by an echo canceller

The species listed above do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, the species lack the same or corresponding special technical features for the following reasons: Each group is drawn to a different technical feature. The features being various improvements upon the already known two way communications device disclosed in applicant's admitted prior art (Specification page 1 line 28 to page 3 line 10).